HEALTH ASPECTS OF PETROLEUM PRODUCTS ENGLISH

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1. INTRODUCTION

Petroleum products, like many other substances in industrial settings, have inherent hazards to health. Knowledge of these hazards and how to avoid exposure to these products, will in most cases prevent adverse health effects occurring in employees in the petroleum industry. While this document does not cover safety hazards which arise from flammability of fuels and lubricants, it must be remembered that many petroleum products are highly flammable. Invisible pockets of flammable vapours can collect at ground level. In all emergency situations, care must be taken to avoid explosion and fire, by removing affected persons from the sea, or ensuring that the area is well ventilated.

2. POTENTIAL HEALTH HAZARDS

Petroleum fuels are generally stored and handled in systems which can be considered ‘closed’ (rail and road tankers, pipelines and storage tanks). This minimises the probability of direct
contact with the product, and therefore minimises risk to health. In handling situations where the systems are not closed (bulk loading and retail dispensing), there are potential health risks. This is particularly so when fuels are handled carelessly, or misused. The ways in which a product can come into contact with, or enter, the body to cause damage are:
- Contact with skin or eyes
- Absorption through the skin
- Swallowing (Ingestion)
- Entry of a liquid into the lungs (Aspiration)
- Breathing in (Inhalation)
Effects may be directly on the exposed organ (e.g. skin or lung) or on another organ, due to absorption of the substance into the bloodstream.

3. MAIN HAZARDS

3.1 Skin

The liquid fuels (gasoline, diesoline, kerosine, methanol and residual fuel oil) and some of the liquid lubricants can cause defatting of the skin (removal of the thin layer of oil on the skin). This causes a skin rash to appear (Irritant contact dermatitis). Prolonged immersion in gasoline or kerosine (e.g. in a vehicle accident) may cause a chemical burn. Liquified Petroleum Gas (LPG), because it evaporates rapidly from the skin, can cause cold burns. Brake fluid is mildly irritating to the skin. Benzine (i.e. cleaning benzine) and Low Aromatic White Spirit (L.A.W.S. or Mineral Turpentine), both solvents, can irritate the skin after prolonged or repeated contact. Most petroleum products can also be absorbed through the skin and affect the body organs. Diesel additive (NEMO 2001) is readily absorbed through the skin and causes reduced blood pressure, severe headaches, flushing, dizziness or weakness, heart palpitations, nausea and fatigue. Individuals on antihypertensive drugs are especially susceptible to exposure. Long-term exposure to NEMO 2001 causes de-fatting of the skin with resultant contact irritant dermatitis.

3.2 Eyes

Petroleum fuel, splashed into the eyes, can cause irritation. High concentrations of fuel vapour can also irritate the eyes. Brake fluid and benzine can slightly irritate the eyes. LPG can cause cold burns of the eyes. L.A.W.S. is not expected to cause eye irritation.

3.3 Ingestion

This occurs usually only as an accident. Petroleum fuels and lubricants usually have a low toxicity, and the most amount swallowed is limited by their taste and smell (but see 3.4). Brake fluid, if ingested, may cause kidney damage. Methanol if ingested, may cause severe acute and delayed toxic effects in small quantities. (15 ml undiluted methanol may cause blindness; 70 - 100 ml is usually fatal). Antifreeze (ethylene glycol) causes symptoms typical of alcohol intoxication. A huge dose (100 ml) can cause coma and stop the person’s breathing. Ingestion of diesel additive (NEMO 2001) is highly unlikely. If it occurs, the symptoms will be similar to those for skin or inhalation exposure.
3.4 Aspiration

Aspiration of liquid fuels into the lungs usually occurs as a result of swallowing the fuel. It can give rise to a chemical pneumonia which can be serious or even fatal. The low viscosity fuels (gasoline, kerosine, or diesel fuels) are a far greater hazard than the residual fuel oils. Ingestion of benzine or L.A.W.S. can also give rise to aspiration into the lungs.

3.5 Inhalation

For fuels that evaporate easily (LPG, gasoline), there is a possibility of exposure to vapour where the handling system is not closed. This is particularly so where the fuel is handled in a confined space. The vapour can cause irritation of the nose, mouth and lungs; headaches, nausea; mental confusion. There is also a danger of asphyxiation (inability to breathe) due to the vapours displacing air, and therefore oxygen, in confined spaces (e.g. fuel storage tanks). Methanol vapour is irritant to the lungs and respiratory tract. It is absorbed from the lungs and may cause severe, often delayed systematic effects. Benzine (i.e. cleaning benzine), after inhalation of the product vapour, can be absorbed into the bloodstream, and thus cause toxic effects, such as headache, nausea and dizziness. Aspiration of L.A.W.S. is not expected to be an inhalation hazard.

Overexposure to Diesel additive (NEMO 2001) by inhalation causes similar effects to skin exposure to this product (see 3.1)

3.6 Long-term effects

Motor gasoline contains benzene, (not cleaning benzine) which may lead to abnormalities of the bone marrow and blood if there is long-term exposure to gasoline vapours. In bulk loading and retail dispensing, inhalation of these vapours must be avoided.

4. PRECAUTIONS FOR SAFE HANDLING AND USE

Because fuels are normally stored and handled in closed systems, the potential hazards are unlikely to arise except through misuse or accident. The hazards can be avoided as follows:
- use of fuels only for their intended purpose;
  - storage of fuels only in correctly labelled containers;

The domestic storage of paraffin in unlabelled clear glass bottles and other containers must be strongly discouraged;
- avoiding undue skin, eye or lung contact with fuel products or their vapours;
- not ingesting fuels

This includes not siphoning fuels by mouth suction through a plastic or other tube;
- practice of good personal hygiene in the workplace;
- do not use liquid fuels to remove grease or dirt from the skin.

Benzine:
- store drums in a well ventilated place away from direct sunlight and other sources of heat.
- store in correctly labelled containers.

5. EMERGENCY TREATMENT
5.1 Liquified Petroleum Gas (LPG)

First Aid
For exposure to inhaled LPG, remove the casualty to fresh air (rescuers must take precautions to avoid exposure to the gas). If the casualty is not breathing, give artificial respiration, and external cardiac massage if there is no heartbeat. If unconscious but breathing, place in the recovery position. Obtain medical assistance. For cold burns (skin, eyes), cover the wounds with sterile dressings and obtain medical assistance. Do not apply any medication. Information for doctors Treat with supportive measures according to the patient’s condition.

5.2 Motor gasoline (Petrol, aviation gasoline)

First Aid
Treatment for inhalation is as for LPG. For ingestion (swallowing) or aspiration DO NOT make the person vomit. Obtain medical assistance immediately. For skin contact, remove all contaminated clothing and wash the affected skin with soap and water. For eye contact, wash out with adequate amounts of water. If irritation persists, obtain medical assistance.

Information for doctors
Administration of medicinal liquid paraffin may reduce intestinal absorption after ingestion. Gastric lavage should only be done after endotracheal intubation due to the risk of aspiration. Chemical pneumonitis should be treated with antibiotics and corticosteroids.

5.3 Kerosine (Paraffin, illuminating paraffin, jet fuel)

As for 5.2.

5.4 Gas oils and diesel fuels

As for 5.2.

5.5 Fuel oils (Residual fuels, bunker oil)

First Aid
These products do not release significant amounts of vapour under normal storage and handling conditions. However, hydrogen sulphide may be present in a confined vapour space. If hydrogen sulphide poisoning occurs, the treatment is as for inhaled LPG. Further first aid treatment is as for 5.2; but remember that hot fuel oil may cause skin and/or eye burns.

Information for doctors
Treat with supportive measures according to the patient’s condition.

5.6 Lubricating oils
First Aid

Treatment for ingestion, aspiration and skin/eye contact is as for 5.2. DO NOT use gasoline or kerosine to clean lubricating oil off the skin. If an accident with hydraulic equipment occurs, there may be ‘injection’ of oil and under the skin. This requires prompt medical assistance.

Information for doctors
If there is toxicity due to ingestion (because of the toxicity of additives), detailed information should be obtained on the product composition, and treatment given accordingly. Failing this, supportive treatment should be given as indicated by the patient’s condition. Gastric lavage should be done only after endotracheal intubation.

Chemical pneumonitis should be treated with antibiotics and corticosteroids. Injection of lubrication oils under the skin should be treated with wide incision, debridement and irrigation.

5.7 Brake fluid

First Aid

As for 5.2

Information for doctors

For ingestion of high doses, treat by gastric lavage after endotracheal intubation to prevent aspiration. Thereafter, treat by observation and supportive measures as indicated by the patient’s condition. Monitor renal function in view of the possibility of renal damage.

5.8 Lubricating greases

These compounds have very low exposure and toxicity potential. Repeated skin contact may lead to a variety of conditions, from dry skin to inflammation of hair follicles.

First Aid

As for 5.6

Information for doctors

Ingestion of lubricating greases is unlikely, and supportive therapy alone is indicated. Injection under the skin by hydraulic equipment should be treated as for 5.6.

5.9 Bitumens (Asphalt)

The only significant hazard is skin burns. Avoid working in confined spaces with hot bitumen, as hydrogen sulphide may be released.

First Aid

Should hydrogen sulphide poisoning occur, the treatment is as for LPG inhalation. For skin burns, the bitumen should not be removed from the skin. The affected part should be put
under cold running water for 10 minutes, dressed with clean dressings (no ointment/creams/powders) and medical assistance obtained. If hot bitumen splashes into the eye, cool it with cold running water for 10 minutes and obtain medical assistance. If cold bitumen is in contact with the eye, wash out with water. If irritation persists, or bitumen remains in the eye, obtain medical assistance.

Information for doctors

No attempt should ordinarily be made to remove adhering bitumen from the skin, as it forms a sterile dressing and will detach itself after a few days. If bitumen adheres around the entire circumference of a limb, it should be split to avoid a tourniquet effect. If there is a definite indication to remove the bitumen, this may be done with a blend of medical paraffin and kerosine. Care must, however, be taken as kerosine may cause skin irritation.

5.10 Methanol

First Aid

For inhalation remove the person to fresh air. If the casualty is not breathing, give artificial respiration. If unconscious but breathing, place in the recovery position. Obtain medical assistance. For skin contact, remove contaminated clothing and wash affected skin with water. Obtain medical assistance, as methanol can be absorbed by the skin. For ingestion, DO NOT make the person vomit. Obtain medical assistance immediately.

Information for doctors

Signs of acute methanol intoxication may be delayed 18-36 or more hours. Weakness, anorexia and headache may be followed by blurred vision, dilated pupils and coma. Those who survive may suffer from blindness, motor dysfunction and possibly dementia. For acute intoxication, therapeutic regimes should include correction of the acidosis, the use of ethanol and haemodialysis as well as supportive measures where necessary (e.g. gastric lavage, electrolyte imbalances etc.) The acidosis due in part to formic acid may be corrected with alkali solutions. Potassium supplements may also be required. Ethanol given orally to maintain a blood alcohol level of about 100 - 200 mg/dl acts by competitive inhibition of liver enzymes and reduces the rate of metabolism (and hence production of formic acid) of methanol. The ethanol is usually given for several days after apparent recovery. Haemodialysis has been shown to enhance recovery presumably by increasing the rate of excretion of methanol and/or its metabolites.

5.11 Antifreeze

First Aid

For ingestion, DO NOT make the person vomit. Obtain medical assistance immediately. Information for doctors Ingestion of 100ml of ethylene glycol can cause coma, pulmonary oedema, respiratory failure and death. Ethanol competes with ethylene glycol as a substrate for liver alcohol dehydrogenase. Ethylene glycol poisoning should be treated with an oral
loading dose of 0.6g/kg of 50% ethanol, oral maintenance doses of 109mg/kg of 20% ethanol hourly, and rapid initiation of hemodialysis. Renal function should be monitored, as acute tubular necrosis may occur.

5.12 Benzine
As for 5.2.

5.13 L.A.W.S.
As for 5.2.

5.14 Diesel additive (NEMO 2001)

First Aid

For inhalation exposure, remove the person to fresh air.
For skin exposure, wash the substance off the person’s skin with room temperature water; remove contaminated clothing.
DO NOT use hot water to wash the substance off the skin.
Place the person in the shock position (lying supine with legs elevated).
Give oxygen if available.
If respiration or heartbeat stops, give artificial resuscitation. ALWAYS use an oral protective respiratory resuscitative device in order to prevent contamination of the first aider’s mouth parts with the substance; especially in case of ingestion.
In case of ingestion, do not induce the person to vomit. The mouth can be rinsed out with cool water.
Obtain medical assistance immediately.

Information for doctors:
Nemo 2001 contains ethylhexylnitrate, solvent naptha and trimethylbenzene.
Ethylhexylnitrate is a vasodilator substance (similar to glyceryl trinitrate as used for treatment of angina). It causes hypotension, severe headaches, weakness, palpitations and fatigue.
Persons on antihypertensive medication are particularly susceptible to this effect.
Naphtha and trimethylbenzene cause nausea, confusion and possibly stupor. Treatment for the latter two substances is symptomatic only.
Treatment for vasodilatation by the former, is postural (supine position with elevated legs). Trendelenburg position can be considered.
For severe hypotension, not responding to symptomatic measures, inhalation of a combination β1/2 stimulant (e.g. fenoterol) may be considered.
Cardiorespiratory arrest requires non-specific supportive treatment.

Long-term chronic exposure to nitrates may cause chronic vasodilatation, with rebound coronary artery spasm when exposure ceases for two or more days. This may mimic cardiac ischaemia and angina.

Long-term exposure to naphtha and benzene compounds may cause methaemoglobinaemia.